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Indian Standard
**SPECIFICATION FOR
LIFEBOAT COMPASS—LIQUID TYPE**

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG

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Indian Standard

SPECIFICATION FOR LIFEBOAT COMPASS—LIQUID TYPE

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SPECIFICATION FOR LIFEBOAT COMPASS—LIQUID TYPE

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 18 March 1968, after the draft finalized by the Marine Instruments and Safety Aids Sectional Committee had been approved by the Mechanical Engineering Division Council.

0.2 Lifeboat compass is a necessary equipment of a lifeboat for determining the course of the lifeboat. It consists of a directional system supported on a single pivot, inside a bowl, which is completely filled with liquid, and which is supported in gimbals. It has the advantage of giving a reading directly in terms of direction referred to magnetic North.

0.3 This standard generally incorporates the requirements under the *Merchant Shipping Act, 1958* and the rules made thereunder, and in addition lifeboat compass is subject to the approval by the Government of India, under the said Act and the Rules.

0.4 In the preparation of this standard, considerable assistance has been derived from Draft ISO Recommendation No. 857 'Magnetic compasses, binnacles and azimuth reading devices, Class B, for use in sea navigation' issued by International Organization for Standardization.

1. SCOPE

1.1 This standard gives the requirements and materials for lifeboat magnetic compasses—liquid type, having a direct reading system.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 True Bearing — The horizontal angle measured from the true North in a clockwise direction to desired line.

2.2 Magnetic Bearing — The horizontal angle measured from the magnetic North in a clockwise direction to desired line.

2.3 Liquid Compass — Compass whose card is immersed in liquid.

2.4 Directional System—Assembly of compass card, pivot bearing and magnetic needle, which, in the absence of magnetic fields due to the boat, settles in constant alignment with the magnetic meridian due to the action of terrestrial magnetism on the magnetic needle. The card is graduated and read against a lubber mark in relation to the boat's head.

2.5 Lubber Line—Vertical line on inside of compass bowl corresponding with the boat's fore-and-aft line.

2.6 Binnacle—A fixed stand for supporting and housing a compass. It supports the compass in gimbals so that the effects of the pitching and rolling motions of the boat are minimized; it contains a provision for illuminating the compass card.

2.7 Point of Compass—A mark on the compass card. The arc between two adjacent points is $11^{\circ}15'$. There are then 32 points to complete the circle.

2.8 Period—It is the time taken by a complete oscillation of the card after a certain deflection, a swing past the position of rest and back again to the completion of its swing on the side to which it was originally deflected.

2.9 Verge Ring—Ring for retaining the top glass cover of the compass. It may or may not be graduated in degrees relative to boat's head. However, diametrically two opposite points are marked for checking.

2.10 Directional Error—A geometrical and constructional error of the directional system, comprising inaccuracies in graduation, eccentricity of the card at its bearing and inaccuracies of orientation of the card on the magnetic system.

2.11 Lubber Error—The angle between the vertical plane passing through the lubber line and the centre of rotation of the card, and the vertical plane passing through the fore-and-aft gimbal axis.

3. COMPONENTS

3.1 Magnet Assembly—The magnet assembly shall consist of a magnet fitted with a conical agate, sapphire, ruby or suitable hard metal at its centre. The north-seeking end shall be marked with an arrow-head.

3.2 Bearing Indicating System—The bearing indicating system shall consist of a graduated circular disc slightly larger in diameter than the length of the magnet, the graduations being on a translucent disc of mother-of-pearl, mica or any other suitable material.

3.3 Damping-cum-Antiwear System—The liquid serves both as damping and antiwear device. The inside of housing may be given a coat of suitable protective paint.

4. MATERIAL

4.1 Materials — All parts of the compass, except the magnet needle, shall be made of non-magnetic materials.

4.2 The material for various parts of lifeboat compass — liquid type, shall be as given in Table 1.

**TABLE 1 MATERIAL FOR VARIOUS PARTS OF LIFEBOAT
COMPASS — LIQUID TYPE**

NAME OF PART	MATERIAL	IS : NUMBER
Magnet centres	Magnet steel, agate, sapphire, ruby or suitable hard material	—
Dial	Mother-of-pearl, mica or any other suitable material	2464 - 1963*
Pivot tip	Hardened steel, iridium or equally suitable hard material	—
Bowl	Brass or aluminium or any other non-magnetic material	422 - 1959† 21 - 1959‡
Binnacle	Brass or aluminium or any other non-magnetic material	422 - 1959† 21 - 1959‡

*Specification for built-up mica for electrical purposes.

†Specification for brass sheet and strip for the manufacture of utensils.

‡Specification for wrought aluminium and aluminium alloy for utensils (second revision).

5. CONSTRUCTIONAL AND OTHER REQUIREMENTS

5.1 Magnetic Needle — The magnetic needle shall have an ample directive force.

5.1.1 A period of 12 to 15 seconds after a deflection of 40° at a temperature of about 15°C shall be considered to have ample directive force.

5.1.2 The magnets used in the directional system of the compass shall be of a suitable magnetic material having high remanence and a high coercive force.

5.2 Centre — The centre shall be of good quality natural or synthetic white sapphire, ruby, agate or hard metal free from inclusions and other defects. It shall be removable from float.

5.3 Dial — The dial shall be of good quality material and if made of mica shall be of uniform colour.

5.3.1 The compass card shall not be less than 100 mm in diameter and shall have a clearance from the bowl of at least 6 mm.

5.3.2 The compass card shall be graduated in half points or at equal intervals of 5° starting from North in the clockwise direction as viewed from above.

The cardinal points are indicated by capital letters N, S, E and W. North point shall be indicated by a suitable emblem. The intermediate points may also be marked. The card shall be luminized or the compass shall be fitted with suitable means of illumination.

5.3.3 It shall be possible for a person with normal vision to read the course, the lubber mark and the graduations on the card, at a distance of 1 metre, in both daylight and artificial light. The use of magnifying device is permitted.

5.3.4 If only a part of the card is visible, it shall be possible to read a minimum of 15° on each side of the lubber mark.

5.4 Liquid—The liquid used shall be a mixture of industrial methylated spirit and water. It shall be clear and free from sediment.

5.4.1 The mixture shall have a specific gravity of 0.93 at 15°C .

5.4.2 The arrangements made to allow for the expansion and contraction of the liquid shall enable the compass to withstand a temperature range of -30°C to $+60^{\circ}\text{C}$ without leakage, formation of bubbles and other defects.

5.5 Sealing Glass—The thickness of the compass glass shall not be less than 4.5 mm, if non-toughened, and not less than 3 mm, if toughened.

5.6 Paint—The paint shall not blister, cracks or discolour appreciably over the temperature range of -30°C to $+60^{\circ}\text{C}$.

5.7 Bowl—The minimum thickness of the metal used in the construction of the bowl shall be not less than 0.8 mm. The compass bowl shall be efficiently stiffened to take gimbal pins.

5.7.1 The bowl shall be adequately weighted and properly poised in the gimbals which shall give a fore-and-aft and thwartship action. The gimbaling shall be in the same horizontal plane as the point of suspension of the card and the outer gimbal pin shall be placed fore-and-aft.

5.7.2 The bowl shall be placed in a binnacle or box of non-magnetic material.

5.7.3 The balance of the compass bowl shall not be disturbed by any magnifying device or by any azimuth reading device provided for use with the compass.

5.8 Bowl Mounting—The bowl of the compass shall be so mounted that the verge ring remains horizontal when the binnacle is tilted 40° in any direction and compass cannot be dislodged under any conditions of sea or weather.

5.9 The binnacle shall be swaged or spun into the base ring and soldered all round. The minimum thickness of the metal used in the construction of binnacle shall be not less than 0.6 mm.

5.10 The materials and workmanship shall be good throughout and compass shall be such as will remain efficient under sea-going conditions.

6. DIRECTIONAL SYSTEM

6.1 Moment of Inertia — The moment of inertia of the directional system should be appreciably the same about all horizontal axes passing through the bearing surface of the pivot jewel.

6.2 Suspension — The directional system shall be retained in position by suitable means and remain free when the bowl is tilted 10° in any direction.

6.3 Supporting Force — When measured at a temperature of $20^{\circ} \pm 3^{\circ}\text{C}$, the force exerted by the directional system of the pivot in the liquid used shall be between 3 gf and 12 gf (3 to 12 cN) when the diameter of the card is 165 mm or less.

6.4 Magnetic Moment — The magnetic moment of the magnets in the directional system shall not be less than the value given in Fig. 1.

6.5 Period — When measured at a temperature of $20^{\circ} \pm 3^{\circ}\text{C}$, the half period of the directional system shall not be less than $\sqrt{12/H}$ seconds for cards of 100 to 150 mm, following an initial deflection of the card of 40° from the magnetic meridian, where H is the horizontal magnetic field strength in oersteds*.

7. ACCURACY

7.1 Constructional Error — The directional error as defined in 2.10 shall not exceed 1° on any heading.

When the lubber mark is fixed, the lubber error as defined in 2.11 shall not exceed 1°.

7.2 Error due to Friction — With the compass at a temperature of $20^{\circ} \pm 3^{\circ}\text{C}$, the card when given an initial deflection of 2° first on one side of the magnetic meridian and then on the other, shall return to within $\left(\frac{0.06}{H}\right)^{\circ}$ of its original position, where H is the horizontal magnetic field strength in oersteds*.

7.3 Swirl Error — When the compass is at a temperature of $20^{\circ} \pm 3^{\circ}\text{C}$, and rotating at a uniform speed of 6° per second in the horizontal plane,

*To convert oersted to ampere per metre, multiply by $\frac{10^3}{4\pi}$.

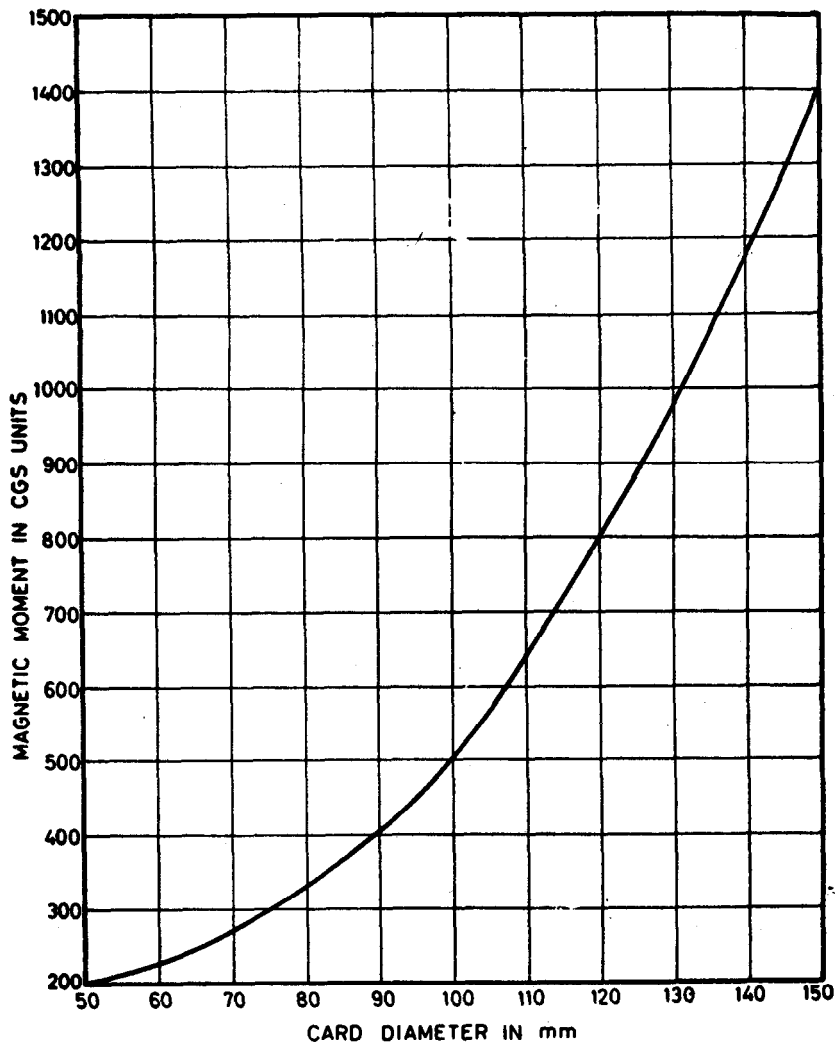


FIG. 1 MAGNETIC MOMENTS FOR DIFFERENT CARD DIAMETERS

the deflection of the card shall not be more than $\left(\frac{1.08}{H}\right)^{\circ}$ from the magnetic meridian when the bowl has been rotated through 180° . Alternatively when the compass is at a temperature of $20^{\circ} \pm 3^{\circ}\text{C}$, and rotating at a uniform speed of 1.5° per second, the deflection when the bowl has been rotated through 360° , shall at no point be more than $\left(\frac{0.36}{H}\right)^{\circ}$ for compasses with cards less than 200 mm in diameter.

7.4 Fore-and-Aft Marks — The fore-and-aft marks on the binnacle, if provided, and the axis and the fore-and-aft gimbal bearings shall be in the same vertical plane to within 1° .

7.5 Range of Tilt — The whole assembly, namely, compass, gimbal and binnacles, shall be tilted through an angle of 40° either way from the horizontal position and rotated. The suspension unit shall in no position foul with the bowl.

8. MARKING

8.1 The compass bowl shall be engraved or stamped with the maker's identification mark and the year of manufacture.

8.1.1 The compasses may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act, and the Rules and Regulations made thereunder. Presence of this mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard, under a well-defined system of inspection, testing and quality control during production. This system, which is devised and supervised by ISI and operated by the producer, has the further safeguard that the products as actually marketed are continuously checked by ISI for conformity to the standard. Details of conditions, under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

9. PACKING

9.1 Each compass shall be securely packed and placed upside down in the box to prevent damage to the pivot.

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